

Biological Assessment Report

Indian, Middle Indian, North Indian, and South Indian Creeks Newton and McDonald Counties, Missouri

Fall 2009 – Spring 2010

Prepared for:
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Division of Environmental Quality
Water Protection Program
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1.0 Introduction

At the request of the Missouri Department of Natural Resources (**MDNR**), Water Protection Program (**WPP**), the Environmental Services Program (**ESP**), Water Quality Monitoring Section (**WQMS**) conducted a macroinvertebrate bioassessment and habitat study of Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek. Indian Creek (Water Body Identification Number (**WBID**) 3256) is located in Newton and McDonald counties. Middle Indian (WBID 3262 and 3263), North Indian (WBID 3260), and South Indian (WBID 3259) creeks are located in Newton County and constitute the upper tributaries of Indian Creek. Indian Creek flows southwest from Boulder City to its confluence with Elk River approximately 1.5 miles southwest of Lanagan, Missouri in McDonald County. These streams are located in the Ozark/Neosho Ecological Drainage Unit (**EDU**). The primary land use in this EDU is grassland. See the inset in Figure 1 for general stream locations of the Indian, Middle Indian, North Indian, and South Indian creek stations.

Indian Creek (26 miles) is classified as a class P stream per the Missouri Water Quality Standards (**WQS**) (MDNR 2009a) with the following designated uses: irrigation; livestock and wildlife watering; protection of warm water aquatic life and human health fish consumption; cool water fishery; category A whole body contact recreation; and secondary contact recreation. The lower 2.5 mile section of Middle Indian Creek, from the mouth to Sec. 16, T24N, R30W is classified as a class P stream per the Missouri WQS (MDNR 2009a). The upper section of Middle Indian Creek from Sec. 16, T24N, R30W to Sec. 12, T24N, R30W (3 miles) is classified as a class C stream per the Missouri WQS (MDNR 2009a). Both classifications of Middle Indian Creek have the following designated uses: livestock and wildlife watering; protection of warm water aquatic life and human health fish consumption; and category B whole body contact recreation. North Indian Creek (5 miles) is classified as a class P stream per the Missouri WQS (MDNR 2009a) with the following designated uses: livestock and wildlife watering; protection of warm water aquatic life and human health fish consumption; and category B whole body contact recreation. South Indian Creek (9 miles) is classified as a class P stream per the Missouri WQS (MDNR 2009a) with the following designated uses: livestock and wildlife watering; protection of warm water aquatic life and human health fish consumption; cold water fishery; and category B whole body contact recreation. A class P stream is defined as a stream that maintains permanent flow even in drought periods. A class C stream is defined as a stream that may cease flow in dry periods but maintains permanent pools which support aquatic life.

Indian Creek was listed in the 2006 303(d) list for bacteria impairment. In 2008 the upper 5 miles of Indian Creek as well as the upper 2.5 miles of Middle Indian Creek, North Indian Creek, and South Indian Creek were all listed on the 303(d) list for bacteria from rural nonpoint sources. In addition to the bacteria listings, the 2010 303(d) list, approved by the Missouri Clean Water Commission on November 3, 2010, also lists the

upper 5 miles of Indian Creek and both segments of Middle Indian Creek for unknown pollutants.

Versar Inc. collected data for a bioassessment of Indian Creek, Middle Indian Creek, and North Indian Creek during fall 2006, spring 2007, and fall 2007 (Versar Inc. 2008). Indian Creek was determined to be fully supporting of the protection of aquatic life designated use during all sampling seasons. Middle Indian Creek station 1 ranked as fully supporting except for the fall 2007 sample season. The lower station on Middle Indian Creek, station 2, ranked as fully supporting for all three sampling seasons. North Indian Creek ranked as fully supporting during the spring 2007 sampling and partially supporting during both the fall seasons. Versar explained that this site had very deep pools that were inaccessible and also lacked riffle habitat. Overall, Versar Inc. documented degradation in habitat quality due to poor bank stability and riparian quality along the stream channels as well as the potential for elevated pH.

1.1 Purpose

The purpose of the study was to assess the habitat characteristics, macroinvertebrate community, and physicochemical characteristics of Indian, Middle Indian, North Indian, and South Indian creeks to determine if the biological community was impaired.

1.2 Tasks

- 1) Conduct a bioassessment of the macroinvertebrate community of Indian, Middle Indian, North Indian, and South Indian creeks.
- 2) Conduct a habitat assessment of Indian, Middle Indian, North Indian, and South Indian creeks and the habitat control stream, Mikes Creek.
- 3) Conduct physicochemical monitoring of Indian, Middle Indian, North Indian, and South Indian creeks.

1.3 Null Hypotheses

- 1) Macroinvertebrate assemblages will not differ among Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek.
- 2) Riparian and in-stream habitat will not differ among Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek.
- 3) Macroinvertebrate assemblages will not differ between sample stations on Indian Creek, Middle Indian Creek, North Indian Creek, South Indian Creek, and biocriteria reference streams located within the Ozark/Neosho EDU.
- 4) Riparian and in-stream habitat will not differ between sample stations on Indian Creek, Middle Indian Creek, North Indian Creek, South Indian Creek, and Mikes Creek, a biocriteria reference stream located within the Ozark/Neosho EDU.

2.0 Methods

Sampling was conducted during the fall 2009 and spring 2010 sampling seasons. Fall sampling was conducted on October 6-7, 2009 and consisted of macroinvertebrate

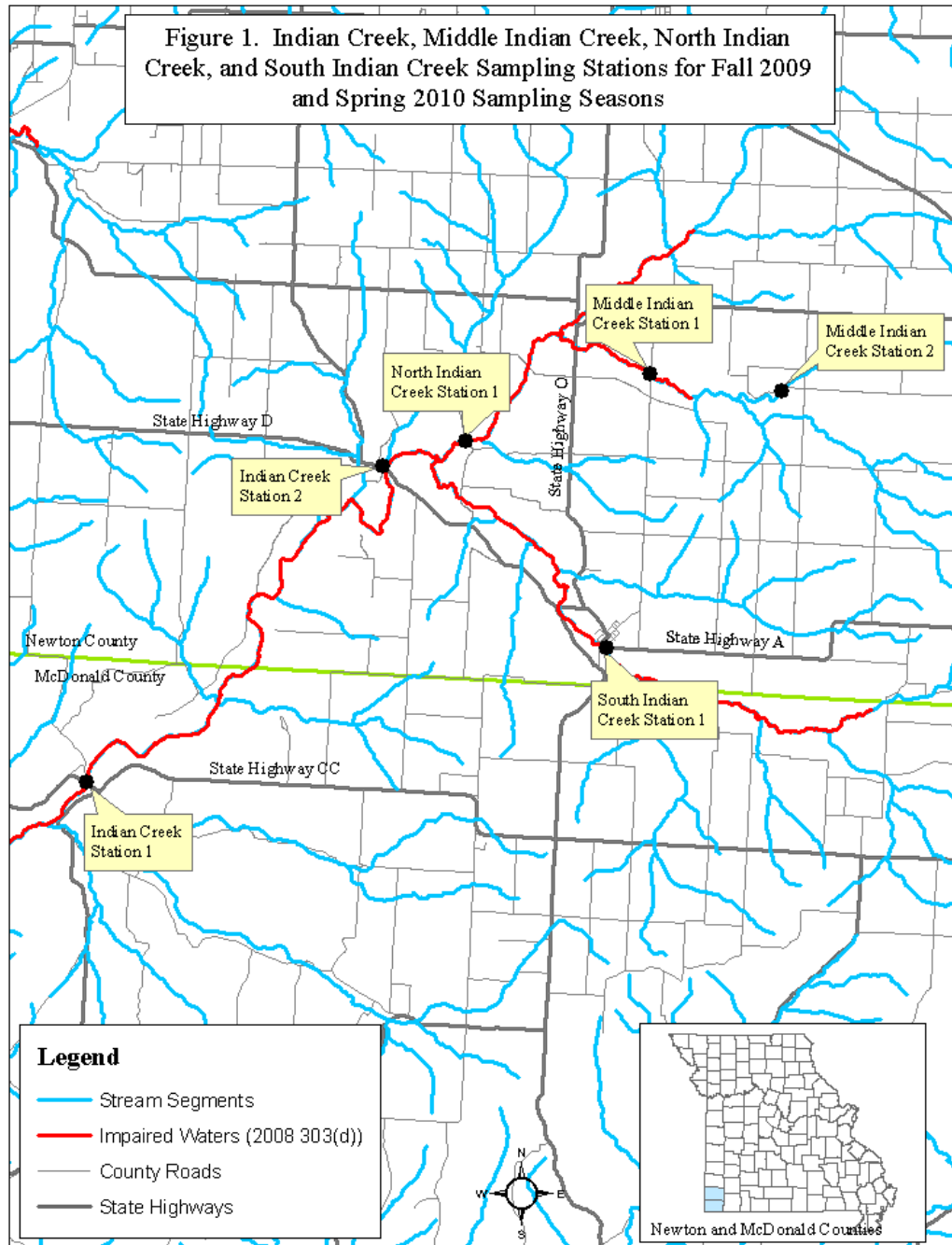
sampling, habitat assessments, and water quality sampling at Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek. Duplicate sampling was conducted on Middle Indian Creek station 1. During the spring macroinvertebrate sampling and water quality sampling were conducted on April 6-7, 2010 at the same stations sampled in the fall. Again, duplicate sampling was conducted on Middle Indian Creek station 1. Methods are included for biological assessments, stream habitat assessments, and physicochemical water quality collection.

2.1 Station Descriptions

The study included sampling two Indian Creek stations, two Middle Indian Creek stations (duplicate sampling was conducted at station 1), one North Indian Creek station, and one South Indian Creek station in Newton and McDonald counties (Figure 1). Station locations and descriptions are listed below in Table 1.

Table 1
Descriptive Information for the Indian Creek, Middle Indian Creek,
North Indian Creek, and South Indian Creek Stations

Stations	Location-UTM Zone 15	Description	County	Class
Indian Creek 1	382861E, 4065983N	Located upstream of State Highway C.	Newton	P
Indian Creek 2	389055E, 4072601N	Located upstream of State Highway D.	McDonald	P
Middle Indian Creek 1a	394602E, 4074516N	Located downstream of Tiger Road.	Newton	P
Middle Indian Creek 1b	394602E, 4074516N	Located downstream of Tiger Road.	Newton	P
Middle Indian Creek 2	397347E, 4074202N	Located downstream of Palm Road.	Newton	C
North Indian Creek	390730E, 4073134N	Located upstream of Skylark Road	Newton	P
South Indian Creek	393579E, 4068860N	Located upstream of Stella City Park	Newton	P



2.1.1 Land Use Description

Indian, Middle Indian, North Indian, and South Indian creeks are located within the Ozark/Neosho EDU. An EDU is a region in which biological communities and habitat conditions can be expected to be similar. A map of the sampling locations can be found in Figure 1. Table 2 compares the land cover percentages from the Ozark/Neosho EDU and the 14-digit Hydrologic Unit Code (HUC) that contains the sampling reaches of the study stations. Percent land cover data were derived from Thematic Mapper satellite images from 2000-2004 and interpreted by the Missouri Resource Assessment Partnership (MoRAP).

Table 2
Percent Land Cover in Indian, Middle Indian, North Indian, and
South Indian Creek Stations and Ozark/Neosho EDU

Stations	14-digit HUC	Urban	Crops	Grass	Forest
Indian Creek 1	11070208060003	1	2	60	34
Indian Creek 2	11070208060002	2	4	76	15
Middle Indian Creek 1a	11070208060001	2	17	71	7
Middle Indian Creek 1b	11070208060001	2	17	71	7
Middle Indian Creek 2	11070208060001	2	17	71	7
North Indian Creek	11070208060002	2	4	76	15
South Indian Creek	11070208060002	2	4	76	15
Ozark/Neosho EDU	-----	4	15	52	25

2.2 Stream Habitat Assessment Project Procedure

Standardized assessment procedures were followed as described for riffle/pool prevalent streams in the Stream Habitat Assessment Project Procedure (SHAPP) (MDNR 2010a). According to the SHAPP, the aquatic community is influenced by the quality of the stream habitat. Stream habitat quality is scored for each station and the scores are compared with the control (reference) SHAPP scores. If the SHAPP score at a test station is $\geq 75\%$ of the SHAPP control scores, the stream habitat at the test station is considered to be comparable to the control (reference) stream. Mikes Creek, located just outside of Powell, Missouri in McDonald County, is a biocriteria reference site and was chosen as the SHAPP control. The SHAPP scores were calculated for the Indian, Middle Indian, North Indian, and South Indian creek stations, compared to the reference SHAPP, and examined for irregular results.

2.3 Bioassessment

2.3.1 Macroinvertebrate Sampling and Analyses

Macroinvertebrate sampling was conducted according to the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (SMSBPP) (MDNR 2010b). Indian, Middle Indian, North Indian, and South Indian creeks are considered riffle/pool dominated systems. The three standard habitats sampled at all locations were: flowing

water over coarse substrate (**CS**); non-flowing water over depositional substrate (**NF**); and rootmat (**RM**). Macroinvertebrate samples were subsampled in the laboratory and identified to specific taxonomic levels (MNDR 2010c) in order to calculate biological metrics (MDNR 2010b).

Macroinvertebrate data were evaluated by comparing the data with the biological criteria reference (**BIOREF**) streams in the Ozark/Neosho EDU. Biological criteria were calculated separately for the fall (mid-September through mid-October) and spring (mid-March through mid-April) index periods. The SMSBPP provides details on the calculation of metrics and scoring of the multi-metric Missouri Stream Condition Index (**MSCI**). The four components of the MSCI are: Taxa Richness (**TR**); total number of taxa in the orders Ephemeroptera, Plecoptera, and Trichoptera Taxa (**EPTT**); Biotic Index (**BI**); and the Shannon Diversity Index (**SDI**). An MSCI score of 16-20 is considered as fully biologically supporting, 10-14 as partially supporting, and 4-8 as non-supporting of the protection of aquatic life designated use.

2.3.2 Physicochemical Water Sampling and Analyses

Physicochemical water samples were handled according to the appropriate MDNR, ESP Standard Operating Procedure (**SOP**) or Project Procedure (**PP**). Results for physicochemical water parameters were examined by season and station. All physicochemical water parameters were sampled by field measurements or grab samples. Water samples were collected according to the SOP MDNR-ESP-001 Required/Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations (MDNR 2009b).

Water quality parameters were measured *in-situ* or collected and returned for analysis at the state environmental laboratory. Temperature (°C) (MDNR 2010d), pH (MDNR 2009c), specific conductance (µS/cm) (MDNR 2010e), dissolved oxygen (mg/L) (MDNR 2009d), and discharge (cfs-cubic feet per second) (MDNR 2010f) were measured in the field. Turbidity (NTU) (MDNR 2010g) was measured and recorded in the ESP, WQMS biology laboratory. The ESP, Chemical Analysis Section (**CAS**) in Jefferson City, Missouri conducted the analyses for ammonia-nitrogen (mg/L), nitrate+nitrite-nitrogen (mg/L), total nitrogen (mg/L), chloride (mg/L), non-filterable residue (mg/L), and total phosphorus (mg/L).

Physicochemical water parameters were compared among stations as well as with Missouri's WQS (MDNR 2009a). Interpretation of acceptable limits in the WQS may be dependent on a stream's classification and its beneficial uses as designated in the WQS (MDNR 2009a).

2.3.3 Discharge

Stream flow was measured using a Marsh-McBirney Model 2000 Flo-Mate current meter at each station during both sampling seasons. Velocity and depth measurements were

recorded at each station according to SOP MDNR-ESP-113 Flow Measurement in Open Channels (MDNR 2010f).

3.0 Results And Analysis

3.1 Land Use

The land use data in Table 2 provide a comparison between the 14-digit hydrologic units covered within the study reaches of Indian, Middle Indian, North Indian, and South Indian creeks and the Ozark/Neosho EDU.

Comparison of the percent land use cover showed all stations were fairly consistent with respect to urban land use. Indian Creek station 1 had slightly less grassland and was more forested than the rest of the stations. The Middle Indian Creek stations had more cropland and less forested land than the remainder of the stations. Comparison of the percent land use cover of the EDU and the 14-digit HUCs containing the study segments showed the Ozark/Neosho EDU had similar amounts of urban land with lesser amounts of grassland. The EDU had similar amounts of cropland as the Middle Indian Creek stations and more than the Indian Creek stations, North Indian Creek, and South Indian Creek. The Ozark/Neosho EDU had more forested land than all sites with the exception of Indian Creek station 1, which had the most forested land.

3.2 Stream Habitat Assessment

Scoring results of the habitat assessment are found in Table 3. If the study station SHAPP score is $\geq 75\%$ of the control station score, the stations are considered to contain comparable habitats. Comparable habitats should be able to support comparable biological communities. All stations scored $>75\%$ of the SHAPP control, Mikes Creek, which scored 148. These stations have comparable habitats and are expected to support comparable biological communities. Indian Creek station 2 and Middle Indian Creek station 1 scored higher than Mikes Creek. South Indian Creek scored the lowest value, 136, while the remainder of the stations scored between 136 and 145.

Table 3
Stream Habitat Assessment Scores and Percentage Comparison

Station	Score	% of Reference
Indian Creek 1	140	96
Indian Creek 2	150	>100
Middle Indian Creek 1a	155	>100
Middle Indian Creek 1b	155	>100
Middle Indian Creek 2	143	97
North Indian Creek	145	98
South Indian Creek	136	92
Mikes Creek (SHAPP Control)	148	-----

Indian Creek was characterized by having a wide channel consisting of sufficient epifaunal substrate. Embeddedness was low at both stations. Station 1 had a fair amount of bedrock, therefore the riffle quality ranked lower than at station 2. Station 2 had a greater variety of velocity regimes with deeper pools present. Neither station had significant channel alterations. Both stations had decent bank stability and vegetative protection on the banks as well as ranking low with regard to sediment deposition. Indian Creek station 1 was located adjacent to McNatt Baptist Church. An area of church property along the stream was mowed and maintained, leaving no riparian zone. There were also remnants of an old bridge crossing downstream of the study reach. Station 2 had a field on one side that minimized the riparian zone. Both stations had signs of people using the river banks to access the water. Crayfish and snails were abundant during both sampling seasons.

Middle Indian Creek had a good mix of cobble and gravel providing epifaunal substrate. Embeddedness was low at each station. Both stations had slight sediment deposition in the pools and average channel flow status. Riffle quality was good with good bank stability and vegetative protection at each station. Neither station showed obvious signs of channel alterations. The velocity/flow regime ranked well at station 1. The velocity/flow regime at station 2 ranked lower due to a lack of deep pools. Middle Indian Creek station 1 was located adjacent to a field that had minimal riparian zone on one side of the stream. Middle Indian Creek station 2 flowed through a pasture and lacked riparian on either side of the stream. Although station 2 lacked a riparian zone, the stream had a good mix of cobble and gravel and good riffle quality. Crayfish and snails were prevalent while sampling.

North Indian Creek was characterized as a wide stream with good epifaunal substrate and velocity/flow regime. The stream had a good mix of substrate sizes and average riffle quality. Slight sediment deposition was present in the pooled areas. The embeddedness ranked low for the study reach. Bank stability rated reasonably high with average vegetative protection, but low with regard to the riparian zone. One side of the stream was partially bordered by a road, while the other side was bordered by a maintained yard. Little to no channelization was present at this site.

South Indian Creek is located adjacent to Stella Park in Stella, Missouri. The creek had a good mix of cobble and gravel providing abundant epifaunal substrate and low embeddedness. The stream had a good velocity/flow regime but lacked deep pools with fast current. There was little sediment deposition and no channel alterations. However, bank stability measures had been taken along the margins of the park via installation of rip rap. There were well developed riffles and good bank stability with mediocre vegetative protection. The stream was bordered on both sides by pasture land and had a poor riparian zone. Crayfish and amphipods were prevalent while sampling during both seasons and sculpins (*Cottus* sp.) were found in the riffles during the spring.

Mikes Creek had good epifaunal substrate with a mix of gravel and cobble but also had many boulders within the channel and several large pools. The velocity/flow regime was well developed except for the lack of fast current in deep pools. Embeddedness ranked a little higher here than at the study sites with some sediment deposition in the pooled areas. Little to no channelization was present. Riffle quality and bank stability both were good, although the banks had less vegetative protection than the study stations. The riparian zone was well developed on both sides of the stream.

3.3 Biological Assessment and Macroinvertebrate Community Analyses

Tables 4 and 5 provide scoring criteria and results for the fall and spring index periods, respectively. MSCI scores were calculated by scoring station metrics against the appropriate BIOREF scores located in the tables. An MSCI score of 16-20 represents a biological community that is fully supporting of the protection of aquatic life beneficial use designation.

During the fall, three stations, Indian Creek station 1, Indian Creek station 2, and Middle Indian Creek station 1b scored in the fully supporting range. The remainder of the stations, Middle Indian station 1a, Middle Indian station 2, North Indian, and South Indian, all scored in the partially supporting range.

Table 4
BIOREF Criteria Metric Scores, Biological Support Category, and
Macroinvertebrate Stream Condition Index (MSCI) Scores, Fall 2009

Stations	Sample No.	TR	EPTT	BI	SDI	MSCI	Support
Indian Creek 1	0918413	92	27	5.9	3.61	18	Full
Indian Creek 2 *	0918414	86	29	5.4	3.24	20	Full
Middle Indian Creek 1a	0918410	67	24	5.6	3.25	14	Partial
Middle Indian Creek 1b	0918411	76	26	5.2	3.39	18	Full
Middle Indian Creek 2	0914415	72	21	6.4	3.08	14	Partial
North Indian Creek	0918412	65	21	5.8	2.4	12	Partial
South Indian Creek	0918409	60	16	5.7	2.59	12	Partial
BIOREF Score=5		>77	>24	<5.5	>2.97	20-16	Full
BIOREF Score=3		77-39	24-12	5.5-7.7	2.97-1.49	14-10	Partial
BIOREF Score=1		<39	<12	>7.7	<1.49	8-4	Non

MSCI Scoring Table (in light gray) developed from BIOREF streams (n = 10 samples). TR=Taxa Richness; EPTT=Ephemeroptera, Plecoptera, Trichoptera Taxa; BI=Biotic Index; SDI=Shannon Diversity Index

* Note: Indian Creek station 2 inadvertently suffered laboratory error. However, sufficient numbers of organisms were picked to calculate an MSCI score.

During the spring, Indian Creek station 1 and the Middle Indian Creek stations scored in the fully supporting range while Indian Creek station 2, North Indian, and South Indian scored in the partially supporting range.

Table 5
BIOREF Criteria Metric Scores, Biological Support Category, and
Macroinvertebrate Stream Condition Index (MSCI) Scores, Spring 2010

Stations	Sample No.	TR	EPTT	BI	SDI	MSCI	Support
Indian Creek 1	1004013	99	35	5.6	3.73	18	Full
Indian Creek 2	1004014	77	27	5.5	2.96	14	Partial
Middle Indian Creek 1a	1004010	76	29	5.0	2.99	18	Full
Middle Indian Creek 1b	1004011	74	29	5.1	3.0	18	Full
Middle Indian Creek 2	1004012	79	28	6.1	2.66	16	Full
North Indian Creek	1004008	63	23	5.9	1.96	12	Partial
South Indian Creek	1004009	72	23	5.9	2.85	12	Partial
BIOREF Score=5		>72	>27	<5.3	>3.01	20-16	Full
BIOREF Score=3		72-36	27-13	5.3-7.7	3.01-1.51	14-10	Partial
BIOREF Score=1		<36	<13	>7.7	<1.51	8-4	Non

MSCI Scoring Table (in light gray) developed from BIOREF streams (n = 12 samples). TR=Taxa Richness; EPTT=Ephemeroptera, Plecoptera, Trichoptera Taxa; BI=Biotic Index; SDI=Shannon Diversity Index

Table 6
Fall 2009 Macroinvertebrate Community Analysis

Fall 2009													
Indian Creek 1		Indian Creek 2		Middle Indian Creek 1a		Middle Indian Creek 1b		Middle Indian Creek 2		North Indian Creek		South Indian Creek	
Order	%	Order	%	Order	%	Order	%	Order	%	Order	%	Order	%
% Ephemeroptera	41	% Ephemeroptera	34.2	% Ephemeroptera	46.8	% Ephemeroptera	47.6	% Ephemeroptera	41	% Ephemeroptera	17.4	% Ephemeroptera	28.9
% Plecoptera	0.3	% Plecoptera	<0.1	% Plecoptera	0.1	% Plecoptera	0.8	% Plecoptera	0.2	% Plecoptera	0.5	% Plecoptera	0.0
% Trichoptera	2.1	% Trichoptera	7.7	% Trichoptera	9.8	% Trichoptera	12.3	% Trichoptera	7.2	% Trichoptera	9	% Trichoptera	0.6
Total EPT %	43.4	Total EPT %	41.9	Total EPT %	56.7	Total EPT %	60.7	Total EPT %	48.4	Total EPT %	26.9	Total EPT %	29.5
% Diptera	11.7	% Diptera	6.5	% Diptera	9.9	% Diptera	13.1	% Diptera	8.5	% Diptera	3.2	% Diptera	10.5
% Dominant Macroinvertebrate Families													
Baetidae	15.2	Gammaridae	18.5	Baetidae	17.7	Baetidae	18.7	Baetidae	22.9	Gammaridae	42.4	Gammaridae	38.6
Caenidae	12.6	Elmidae	16.4	Heptageniidae	13.4	Heptageniidae	13.5	Asellidae	14.9	Elmidae	15.6	Heptageniidae	23.5
Elmidae	11.1	Caenidae	11	Hyalellidae	9.4	Chironomidae	11.6	Planariidae	10.1	Hydropsychidae	6.1	Chironomidae	10.4
Chironomidae	10.7	Baetidae	9.4	Elmidae	9.1	Elmidae	9.3	Chironomidae	8.1	Baetidae	5.1	Elmidae	8.1
Hyalellidae	7.6	Heptageniidae	8.9	Chironomidae	9.1	Caenidae	8.5	Hyalellidae	8	Caenidae	4.9	Planariidae	2.8
Heptageniidae	7.2	Chironomidae	5.7	Caenidae	8.7	Philopotamidae	6.9	Caenidae	7.9	Heptageniidae	4.4	Baetidae	2.4

The fall 2009 macroinvertebrate community analysis is shown in Table 6. All three EPT orders were present at all stations except South Indian Creek which lacked Plecoptera. Ephemeroptera constituted almost 50% of the Middle Indian Creek samples and was lowest at South Indian and North Indian creeks. Total EPT taxa ranged from 60.7% at Middle Indian Creek station 1b to 26.9% at North Indian Creek. Dipterans ranged from 13.1% at Middle Indian Creek station 1b to 3.2% at North Indian Creek.

Baetidae was the dominant family at Indian Creek station 1 and the Middle Indian Creek stations while Gammaridae was the most common family at Indian Creek station 2, North Indian Creek, and South Indian Creek. Caenidae, Heptageniidae, and Elmidae were also common families at most stations. Asellidae and Planariidae were common at Middle Indian Creek station 2.

Table 7
Spring 2010 Macroinvertebrate Community Analysis

Spring 2010													
Indian Creek 1		Indian Creek 2		Middle Indian Creek 1a		Middle Indian Creek 1b		Middle Indian Creek 2		North Indian Creek		South Indian Creek	
Order	%	Order	%	Order	%	Order	%	Order	%	Order	%	Order	%
% Ephemeroptera	29.6	% Ephemeroptera	23.3	% Ephemeroptera	39.3	% Ephemeroptera	48.1	% Ephemeroptera	41.6	% Ephemeroptera	19.2	% Ephemeroptera	31.9
% Plecoptera	1.5	% Plecoptera	1.9	% Plecoptera	7	% Plecoptera	5.5	% Plecoptera	1.1	% Plecoptera	<0.1	% Plecoptera	1
% Trichoptera	1.5	% Trichoptera	4.7	% Trichoptera	1.7	% Trichoptera	2.7	% Trichoptera	1.1	% Trichoptera	0.9	% Trichoptera	0.6
Total EPT %	32.6	Total EPT %	29.9	Total EPT %	48	Total EPT %	56.3	Total EPT %	43.8	Total EPT %	20.1	Total EPT %	33.5
% Diptera	38	% Diptera	12.9	% Diptera	21.1	% Diptera	12.8	% Diptera	7.8	% Diptera	9.9	% Diptera	15.4
% Dominant Macroinvertebrate Families													
Chironomidae	35.6	Gammaridae	33.7	Asellidae	20.6	Baetidae	27.9	Baetidae	31.2	Gammaridae	60.3	Gammaridae	32.5
Elmidae	10.5	Chironomidae	11.7	Baetidae	20.5	Asellidae	19.4	Asellidae	29	Baetidae	9.8	Chironomidae	14.2
Baetidae	7.4	Elmidae	9.9	Chironomidae	20.1	Chironomidae	11.3	Chironomidae	6.7	Chironomidae	9.2	Heptageniidae	12.4
Heptageniidae	7	Baetidae	7	Heptageniidae	10	Heptageniidae	9.2	Heptageniidae	6.5	Heptageniidae	5.2	Baetidae	9.6
Caenidae	5.9	Caenidae	7	Caenidae	6.4	Caenidae	6.7	Planariidae	5.9	Elmidae	4.8	Asellidae	9.3
Asellidae	5.6	Heptageniidae	6.7	Leuctridae	6.2	Leuctridae	5	Crongonyctidae	3	Caenidae	2.1	Ephemerellidae	5.4

The spring 2010 macroinvertebrate community analysis is shown in Table 7. All three EPT orders were present at all stations. Plecoptera abundance was relatively low at North Indian Creek and South Indian Creek. Ephemeroptera made up almost 50% of the Middle Indian Creek station 1b community and consisted of close to 25% or more at all other stations except North Indian Creek which had 19.2% Ephemeroptera. Total EPT taxa ranged from 56.3% at Middle Indian Creek station 1b to 20.1 at North Indian Creek. Dipterans ranged from 38% at Indian Creek station 1 to 7.8% at North Indian Creek.

In the spring sampling, Gammaridae was the most common family at Indian Creek station 2, North Indian Creek, and South Indian Creek while Asellidae was the most common family at Middle Indian Creek station 1a. Baetidae was the most common family at Middle Indian Creek station 1b and Middle Indian Creek station 2 and was commonly found at the other four study streams as well. Chironomidae was another common family at all study streams and the most common family at Indian Creek station 1. Heptageniidae was found at all stations as well, while Elmidae and Caenidae were fairly common at several of the study streams.

3.4 Quantitative Similarity Index

The Quantitative Similarity Index (**QSI**) for Taxa compares two aquatic communities in terms of presence or absence of taxa, also taking relative abundance (percent composition) of each taxa into account. Identical communities have a QSI value of 100% and totally different communities have a value of 0%. In general, values less than 65% indicate environmental stress whereas values greater than 65% occur as natural variation between duplicate samples of the same communities (MDNR 2010b).

Duplicate sampling was conducted at Middle Indian Creek station 1 as a quality control measure during both sampling seasons. Duplicate samples are expected to have a 70% or greater taxa similarity (MDNR 2010b). During the fall sampling period, station 1a scored an MSCI score of 14 while station 1b scored an MSCI score of 18. However, the QSI comparison of the two communities scored 76.6%, indicating the communities are similar. Two of the biological metrics that make up the MSCI scored right at the cusp between the middle and top score. The EPTT category scored a value of 3 at station 1a and a value of 5 at station 1b. The cutoff for the difference between a score of 3 versus 5 was 24 for EPTT. Had one more EPT taxon been present, station 1a would have scored a 5 as well. Station 1a scored 5.6 for the BI while the cutoff to score a 5 was <5.5. Despite the individual metrics having different scores, the QSI percentage for the two samples was sufficient for quality control purposes. During the spring sampling, Middle Indian Creek stations 1a and 1b both had an MSCI score of 18 with a QSI score of 80.3%. All the biological metrics scored very close between these two stations.

3.5 Physicochemical Water Parameters

Physicochemical results from the fall and spring sampling seasons can be found in Tables 8 and 9, respectively. The physicochemical results for both seasons were fairly consistent throughout the watershed. Dissolved oxygen levels were of good quality, ranging from 7.58 mg/L at North Indian Creek to 9.45 mg/L at Middle Indian Creek stations 1a and 1b during the fall sampling period and 8.69 mg/L at Indian Creek station 1 to 11.17 mg/L at South Indian Creek during the spring. When compared to the values in the Missouri WQS, the physicochemical water quality parameters analyzed for this study were not elevated during either season and most likely did not have an effect on the biological community during the study seasons.

Missouri is in the process of developing nutrient criteria for streams and rivers. A total maximum daily load (**TMDL**) for total nitrogen (**TN**) and total phosphorus (**TP**) was approved March 26, 2004 for the Elk River Basin, which includes Indian Creek and its watershed (MDNR WPCP 2004). When comparing TN and TP values of these sites to the TMDL target levels of 1.0 mg/L and 0.06 mg/L, respectively, TN is clearly elevated while TP is below the target levels. During the fall, TN ranged from 4.54 mg/L at South Indian Creek to 6.68 mg/L at Middle Indian Creek station 2 and TP ranged from 0.01 mg/L at South Indian Creek to 0.05 mg/L at North Indian Creek. During the spring, TN ranged from 4.72 mg/L at Indian Creek station 1 to 6.52 mg/L at Middle Indian Creek

station 2. Total phosphorus ranged from 0.03 mg/L at Indian Creek station 2 and South Indian Creek to 0.04 mg/L at the remaining sites: Indian Creek station 1, all three Middle Indian Creek stations, and North Indian Creek.

Table 8
Fall 2009 Physicochemical Water Parameters

Parameters	Indian Creek 1	Indian Creek 2	Middle Indian Creek 1a	Middle Indian Creek 1b	Middle Indian Creek 2	North Indian Creek	South Indian Creek
Ammonia as N (mg/L)	<0.03*	<0.03*	<0.03*	<0.03*	<0.03*	<0.03*	<0.03*
Chloride (mg/L)	7.71	8.07	7.89	7.93	8.09	8.33	7.54
Dissolved Oxygen (mg/L)	8.56	8.03	9.45	9.45	9.03	7.58	8.67
Flow (cfs)	63.89	52.51	11.39	11.39	9.63	33.62	18.99
pH (su)	8.1	7.4	8	8	7.3	7.9	7.8
Specific Conductance (µS/cm)	313	318	325	325	316	338	315
Temperature (°C)	14	15	16	16	17	16	16
Turbidity (NTU)	2.39	1.29	1.77	1.6	2.25	1.53	1.03
Non-Filterable Residue (mg/L)	<5*	<5*	<5*	<5*	<5*	<5*	<5*
Nitrate+Nitrite as N (mg/L)	4.54	5.17	6.27	6.29	6.79	6.78	4.45
Total Nitrogen (mg/L)	4.67	5.12	5.96	6.3	6.68	6.41	4.54
Total Phosphorus (mg/L)	0.04	0.04	0.04	0.04	0.04	0.05	0.01

* Not detected at reported value

Table 9
Spring 2010 Physicochemical Water Parameters

Stations	Indian Creek 1	Indian Creek 2	Middle Indian Creek 1a	Middle Indian Creek 1b	Middle Indian Creek 2	North Indian Creek	South Indian Creek
Parameters							
Ammonia as N (mg/L)	<0.03*	<0.03*	<0.03*	<0.03*	<0.03*	<0.03*	<0.03*
Chloride (mg/L)	6.64	6.88	7.46	7.63	7.51	7.67	6.89
Dissolved Oxygen (mg/L)	8.69	9.14	11.3	11.3	10.18	9.06	11.17
Flow (cfs)	211.71	161.74	32.29	32.29	24.03	69.38	48.74
pH (su)	7.5	7.9	8	8	7.7	7.4	7.9
Specific Conductance (µS/cm)	296	305	308	308	308	308	290
Temperature (°C)	15	14	17	17	15	15	15
Turbidity (NTU)	4.36	3.36	2.21	2.22	2.24	3.18	1.33
Nitrate+Nitrite as N (mg/L)	4.13	4.68	5.82	5.75	6.02	5.97	4.45
Non-Filterable Residue (mg/L)	<5*	5.00	<5*	<5*	<5*	<5*	<5*
Total Nitrogen (mg/L)	4.72	4.87	6.28	6.28	6.52	6.51	4.86
Total Phosphorus (mg/L)	0.04	0.03	0.04	0.04	0.04	0.04	0.03

* Not detected at reported value

3.6 Overview of MSCI Scores

In 2006-2007 Versar Inc. was contracted to conduct a bioassessment to identify possible stressors of several streams in Missouri listed on the 303(d) list. The upper portion of Indian Creek, along with its watershed, was one of the areas examined. This current study attempted to replicate many of the same study stations that Versar sampled. Sampling for both studies (Versar and this current study) included both Indian Creek stations, both Middle Indian Creek stations, and the North Indian Creek station. Versar did not have any stations on South Indian Creek and did not conduct duplicate sampling at Middle Indian Creek station 1. Below is a table (Table 10) summarizing Versar's results and showing DNR's results for comparison with MSCI values shown in parentheses. Versar found both Indian Creek stations and Middle Indian Creek station 2 to be fully supporting during all sampling seasons.

Table 10
MSCI Score Comparisons Between Versar Inc. and DNR

Stream	Versar Sample Number	Versar Fall 2006	Versar Spring 2007	Versar Fall 2007	DNR Fall 2009	DNR Spring 2010
Indian Creek 1	INDI06-F04	Full (18)	Full (16)	Full (18)	Full (18)	Full (18)
Indian Creek 2	INDI06-F05	Full (18)	Full (18)	Full (18)	Full (20)	Partial (14)
Middle Indian Creek 1a	INDI06-F07	Full (16)	Full (18)	Partial (14)	Partial (14)	Full (18)
Middle Indian Creek 1b	-----*				Full (18)	Full (18)
Middle Indian Creek 2	INDI06-F08	Full (16)	Full (18)	Full (16)	Partial (14)	Full (16)
North Indian Creek	INDI06-F06	Partial (12)	Full (16)	Partial (14)	Partial (12)	Partial (12)

* Versar did not conduct duplicate sampling at Middle Indian Creek station 1.

Versar noted that most water quality parameters were in the expected ranges for all sampling seasons. However, pH exceeded 9.0 at North Indian Creek and Middle Indian Creek station 1 during spring 2007. Total phosphorus and nitrate+nitrite as N were high at each site during all sampling seasons based on EPA's recommended criterion levels (US EPA 2000). North and Middle Indian creeks had high sediment loads, poor bank stability due to livestock access, and poor riparian vegetation. Versar noted the possible low MSCI scores for North Indian Creek may relate to lack of prime benthic habitat, specifically lack of quality riffle habitat (riffle habitat ranked low during this study but quality was not considered poor). Versar noted that Middle Indian Creek station 1 showed recent signs of livestock disturbances in the stream bed, along the banks, and trampling in the riparian areas. When comparing the MSCI values in the above table, no definitive trends are present. Indian Creek station 1 was the only station to score fully supporting consistently through all the sampling seasons encompassed in the table.

4.0 Discussion

Macroinvertebrate sampling did not reveal many definitive trends during the fall sampling season. When compared to bioreference streams, both stations on Indian Creek and Middle Indian Creek station 1b scored in the fully supporting range for the biological community. The remainder of the stations, Middle Indian Creek station 1a, Middle Indian Creek station 2, North Indian Creek, and South Indian Creek, all scored in the partially supporting range; therefore, these stations are considered impaired and do not meet the beneficial use of protection of the aquatic life. Middle Indian Creek stations 1a and 2 each had MSCI scores of 14, rating a higher SDI score than North or South Indian creeks, which both had scores of 12. However, each of these four stations rated partially

supporting MSCI scores, with the TR, EPTT, and BI biological metrics receiving mid-range values of 3.

During the spring sampling, the biological community of Indian Creek station 1 and Middle Indian Creek stations 1a, 1b, and 2 scored in the fully supporting range based on biological criteria reference stream data. Indian Creek station 2, North Indian Creek, and South Indian Creek all scored partially supporting. Indian Creek station 2 scored 14 with a higher TR value than either North or South Indian creeks, which both scored 12. All three stations rated low for EPTT, BI, and SDI.

Macroinvertebrate abundances were high during both seasons. During the fall, less than 10% of the samples from each habitat were sub-sampled to reach the target number of organisms, except for two rootmat samples from Middle Indian Creek stations 1a and 1b, where the percentage of material sub-sampled was closer to 20%. During the spring, less than 10% of the samples from each habitat were sub-sampled to reach the target number of organisms for all samples, except the Indian Creek station 2 rootmat, which was sub-sampled at 12.5%. There was not a shortage of macroinvertebrate individuals in the study streams.

The physicochemical results for both seasons were fairly consistent throughout the watershed. When compared to the values in the Missouri WQS, the physicochemical water quality results were not elevated during either season and most likely did not have an effect on the biological community during the study seasons. Some nutrient parameters, however, suggest the presence of nutrient enrichment. Nitrate+nitrite as N and TN values were high. However, TP values were low and ammonia as nitrogen as well as non-filterable residue were below detectable limits at all stations during both sampling seasons.

Although there are currently no nutrient criteria in Missouri for streams and rivers, a TMDL for TN and TP was approved March 26, 2004 for the Elk River Basin (MDNR 2004). When comparing TN and TP values of these sites to the target levels, TN was elevated and TP was below the target levels. Total nitrogen levels were well above the TMDL target level of 1.0 mg/L at all stations during both sampling seasons. The lowest value reported during either season was 4.54 mg/L at South Indian Creek during the fall. Total nitrogen levels were highest, near 6.0 mg/L or above, at the Middle Indian Creek and North Indian Creek stations during both seasons. Total phosphorus levels were below the TMDL target level of 0.6 mg/L at all stations during both seasons. Despite the nutrient enrichment, three stations were fully biologically supporting in the fall and four were fully biologically supporting in the spring. It is hard to conclude if the elevated nitrogen levels had any effect on the macroinvertebrate community and the MSCI scores.

The Indian Creek watershed has been the subject of repeated studies to address water quality concerns. In 2006-2007 Versar Inc. was contracted to conduct a bioassessment to

identify possible stressors of the upper portion of Indian Creek and its watershed. When comparing the MSCI values of Versar's data to the MSCI scores of this study (Table 10), no definitive trends are present. Versar found both Indian Creek stations and Middle Indian Creek station 2 to be fully supporting during all sampling seasons while Middle Indian Creek station 1 and North Indian Creek ranked partially supporting during at least one of the three seasons sampled by Versar. This present study using fall 2009 and spring 2010 data concluded Indian Creek station 1 and Middle Indian Creek station 1b to be fully supporting while Indian Creek station 2 was fully supporting during the fall sampling and partially supporting during the spring. Middle Indian Creek station 1a and station 2 were partially supporting during the fall sampling season and fully supporting during the spring sampling season. North Indian Creek and South Indian Creek ranked as partially supporting during both sampling seasons. Indian Creek station 1 was the only station to consistently score fully supporting through both Versar's sampling and MDNR's current bioassessment. Versar concluded mostly habitat issues to be of concern throughout the watershed, specifically poor bank stability and poor riparian quality as well as excessive silt and sedimentation. In addition, the potential for elevated pH was a concern. Versar recommended soil erosion control plans and nutrient management plans be implemented throughout the watershed.

5.0 Conclusion

Four null hypotheses were stated in the introduction.

- 1) Macroinvertebrate assemblages will not differ among Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek stations.
- 2) Riparian and instream habitat will not differ among Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek stations.
- 3) Macroinvertebrate assemblages will not differ between sample stations on Indian Creek, Middle Indian Creek, North Indian Creek, South Indian Creek and biocriteria reference streams located within the Ozark/Neosho EDU.
- 4) Riparian and in-stream habitat will not differ between sample stations on Indian Creek, Middle Indian Creek, North Indian Creek, South Indian Creek and Mikes Creek, a biocriteria reference stream located within the Ozark/Neosho EDU.

Null hypothesis #1 is rejected. The study stations did not exhibit similar dominant taxa. A variety of dominant families occurred at the stations. During the fall sampling season, Baetidae and Gammaridae were the most common dominant families with Caenidae, Heptageniidae, Elmidae, and Asellidae ranking as the second most dominant families. However, the dominant families did not correspond with specific MSCI categories and were followed by a variety of orders in no distinguishable pattern. Similar to the fall sampling season, a variety of families ranked as dominant families during the spring sampling with no discernable pattern. Gammaridae, Asellidae, Baetidae, and Chironomidae were all dominant families with Heptageniidae, Elmidae, and Caenidae also common at several study stations.

Null hypothesis #2 is accepted. The SHAPP scores for the seven stations in this study ranged from 155 to 136. These scores are within 19 points of each other. The habitat quality of Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek is comparable.

Null hypothesis #3 is rejected. Reference streams within the EDU represent the best available conditions and are the basis of the MSCI scores. Three of the seven stations scored as fully supporting during the fall and four of the seven scored as fully supporting during the spring. Consistently, Indian Creek station 1 and Middle Indian Creek station 1b scored fully supporting during both sampling seasons while North Indian Creek and South Indian Creek scored partially supporting during both seasons. Indian Creek station 2 scored fully supporting during the fall and partially supporting during the spring. While Middle Indian Creek station 1a and Middle Indian Creek station 2 scored partially supporting in the fall, they were fully supporting during the spring sampling season.

Null hypothesis #4 is accepted. The SHAPP scores of the study stations all scored >75% of the SHAPP control stream. The habitat quality of Indian Creek, Middle Indian Creek, North Indian Creek, and South Indian Creek is comparable to the reference station.

6.0 Summary

Indian Creek station 1 and Middle Indian Creek station 1b did achieve fully supporting status during both sampling seasons, demonstrating that the macroinvertebrate community can be viewed as similar to reference streams within this EDU. When taking both seasons into consideration and the variation of scoring between fully biologically supporting and partially biologically supporting for Indian Creek station 2, Middle Indian Creek station 1a, and Middle Indian Creek station 2, it is difficult to arrive at any specific conclusion regarding the overall macroinvertebrate community for these creeks. It appears the stations are capable of occasionally sustaining macroinvertebrate communities comparable to reference conditions within the Ozark/Neosho EDU. Because North Indian Creek and South Indian Creek did not achieve fully supporting for either season, the macroinvertebrate communities cannot be viewed as similar to reference streams within the EDU and, therefore, demonstrate at least some degree of biological impairment.

It is hard to determine what stressors are causing the partially supporting biological communities. Macroinvertebrate abundances were high at all stations. The physicochemical data did not show any definitive trends aside from high nutrient levels at all stations (not just the impaired stations). In addition, the habitat evaluations did not indicate pressing issues specifically at the impaired sites. The three standard habitats for riffle/pool dominated streams were well represented at all stations, with the exception of rootmat which was minimal at Middle Indian Creek station 2 due to the complete lack of riparian zone and the surrounding pastureland. Eroding stream banks, pastureland, and agricultural fields were prevalent throughout the watershed. Siltation did not appear to be

a major concern during these sampling seasons but has been noted as problematic in the past by Versar during 2006-2007. Cobble and large gravel supplied the majority of the epifaunal substrate, while submerged logs and vegetation, as well as undercut banks, were lacking.

Lack of quality riparian areas is a major factor for this watershed. Every station had at least one bank that ranked as having less than 6 meters of riparian vegetation due to human activities, mainly pastureland or agricultural land. North Indian, South Indian, and Middle Indian station 2 had both the left and the right banks with less than 6 meters of riparian vegetation. Riparian areas that were present were composed of a mix of trees, shrubs, grasses, and forbs. A wider riparian area would buffer the influx of soil particles and nutrients from the surrounding landscape. In addition, the vegetation composing the riparian areas, specifically more trees which have greater root depth, would assist in stabilizing the banks and perhaps provide better rootmat habitat, submerged logs, and undercut banks in the stream channels.

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Appendix A

Invertebrate Database Bench Sheet Report:

Indian Creek stations 1 and 2

Middle Indian Creek stations 1a, 1b, and 2

North Indian Creek

South Indian Creek

Grouped by Season (Fall 2009 and Spring 2010) and Station

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [0918413], Station #1, Sample Date: 10/7/2009 9:30:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	18	3	11
AMPHIPODA			
Crangonyx			2
Gammarus			2
Hyaella azteca		1	91
ARHYNCHOBDELLIDA			
Erpobdellidae		2	
BRANCHIOBDELLIDA			
Branchiobdellida	4		
COLEOPTERA			
Dubiraphia		5	31
Ectopria nervosa	-99	4	
Macronychus glabratus			2
Optioservus sandersoni	39	3	
Psephenus herricki	37	5	2
Scirtidae			2
Stenelmis	34	14	6
DECAPODA			
Orconectes macrus	2	-99	
Orconectes neglectus	-99	-99	3
DIPTERA			
Ablabesmyia	1	4	
Cardiocladius	2		
Ceratopogoninae		1	
Chironomidae		2	4
Chironomus		1	
Clinotanytus		1	
Cricotopus bicinctus	1		
Cricotopus/Orthocladius	2	1	2
Cryptochironomus		2	
Dicrotendipes		3	5
Diptera		-99	
Dixella			1
Hydrobaenus			3
Labrundinia		2	21
Microtendipes	6	6	6
Paracladopelma		2	
Paralauterborniella		1	
Paratanytarsus			4

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [0918413], Station #1, Sample Date: 10/7/2009 9:30:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Phaenopsectra	1		
Polypedilum aviceps	11		
Potthastia		1	
Procladius		1	
Simulium	10		
Stempellinella	3	2	
Tanytarsus	4	13	3
Thienemanniella	5		
Thienemannimyia grp.	1	1	1
EPHEMEROPTERA			
Acentrella	2		
Acerpenna	31		
Anthopotamus	4	5	
Baetis	149		
Caenis anceps	22	39	
Caenis latipennis	13	69	9
Ephemera simulans	13	-99	
Eurylophella	1		
Hexagenia limbata		2	-99
Isonychia bicolor	7		
Leptophlebiidae	17	13	6
Leucrocuta	2	-99	
Maccaffertium bednariki	6		
Maccaffertium mediopunctatum	11		
Maccaffertium pulchellum	11		
Procloeon	1	1	
Stenacron	25	20	4
Stenonema femoratum		8	
Tricorythodes	4		
HEMIPTERA			
Corixidae		2	
ISOPODA			
Caecidotea	1		
Lirceus	1	1	10
LEPIDOPTERA			
Petrophila	1		
LIMNOPHILA			
Ancylidae	2	9	10
Menetus			9
LUMBRICINA			

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [0918413], Station #1, Sample Date: 10/7/2009 9:30:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Lumbricina	1		
MEGALOPTERA			
Corydalus	8		
Sialis	1	1	
MESOGASTROPODA			
Elimia	26	2	11
Hydrobiidae	10	16	
ODONATA			
Argia	2		1
Calopteryx		1	1
Enallagma			3
Gomphidae	3		
PLECOPTERA			
Acroneuria	4	-99	
RHYNCHOBDELLIDA			
Glossiphoniidae			-99
TRICHOPTERA			
Cheumatopsyche	6		
Helicopsyche	8		
Hydroptila	2		
Limnephilidae			1
Oecetis			1
Polycentropus		1	2
Triaenodes			5
TRICLADIDA			
Planariidae	6	1	
TUBIFICIDA			
Branchiura sowerbyi		3	2
Limnodrilus hoffmeisteri		3	
Quistradrilus multisetosus		1	
Tubificidae	6	43	6
VENEROIDA			
Corbicula	8		
Pisidiidae	1	1	2

**The Course and Non Flow macroinvertebrate samples for sample number 0918414, Indian Creek Station 2, were inadvertently combined in the lab.

Aquid Invertebrate Database Bench Sheet Report

Indian Cr [0918414], Station #2, Sample Date: 10/7/2009 1:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS**	NF	RM
"HYDRACARINA"			
Acarina	22		6
AMPHIPODA			
Gammarus	232		38
Hyaella azteca			38
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
COLEOPTERA			
Dubiraphia	39		10
Macronychus glabratus			5
Optioservus sandersoni	165		5
Psephenus herricki	14		
Stenelmis	11		5
DECAPODA			
Orconectes macrus	-99		
Orconectes neglectus	-99		2
DIPTERA			
Ablabesmyia	2		1
Ceratopogoninae	2		
Chironomidae	1		
Cladotanytarsus	1		
Corynoneura	3		
Cricotopus/Orthocladius	1		
Cryptochironomus	5		
Dicrotendipes	2		1
Dixella			2
Eukiefferiella	1		
Hexatoma	-99		
Hydrobaenus			1
Labrundinia	1		
Micropsectra			2
Microtendipes	13		3
Nanocladius			1
Nilotanypus			1
Polypedilum aviceps	7		
Polypedilum scalaenum grp	3		
Procladius	2		
Simulium	6		
Stempellinella	12		1

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [0918414], Station #2, Sample Date: 10/7/2009 1:00:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS**	NF	RM
Tabanus	1		
Tanytarsus	7		3
Thienemanniella	2		
Thienemannimyia grp.	2		4
Tribelos	1		
EPHEMEROPTERA			
Acentrella	31		
Acerpenna	5		
Baetis	97		2
Caenis anceps	22		
Caenis latipennis	122		17
Callibaetis	2		
Choroterpes	5		
Ephemera simulans	5		
Eurylophella	4		
Heptageniidae	59		6
Isonychia bicolor	1		2
Leptophlebiidae	44		8
Leucrocuta	5	4	
Maccaffertium mediopunctatum	2		
Maccaffertium modestum	34		
Procloeon			1
Stenacron	17		
Stenonema femoratum	3		
Tricorythodes	2		
HEMIPTERA			
Corixidae	2		
Rheumatobates			1
ISOPODA			
Caecidotea	5		
Lirceus	9		1
LEPIDOPTERA			
Petrophila	1		
LIMNOPHILA			
Ancylidae	4		3
Menetus	1		5
Physella			4
LUMBRICINA			
Lumbricina	-99		1
MEGALOPTERA			
Corydalus	2		

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [0918414], Station #2, Sample Date: 10/7/2009 1:00:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS**	NF	RM
Nigronia serricornis	1		
MESOGASTROPODA			
Elimia	21		36
ODONATA			
Argia			1
Calopteryx			21
Enallagma			3
Gomphidae	1		
PLECOPTERA			
Perlesta	1		
TRICHOPTERA			
Ceratopsyche morosa grp	1		1
Cheumatopsyche	32		9
Chimarra	5		
Helicopsyche	40		1
Nectopsyche	1		
Oecetis			1
Polycentropus			1
Rhyacophila			1
Triaenodes			20
TRICLADIDA			
Planariidae	11		
TUBIFICIDA			
Tubificidae	15		
VENEROIDA			
Pisidiidae	7		1

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918410], Station #1a, Sample Date: 10/6/2009 1:15:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1	1	4
AMPHIPODA			
Hyaella azteca			109
ARHYNCHOBDELLIDA			
Erpobdellidae		1	
COLEOPTERA			
Dubiraphia			31
Ectopria nervosa			1
Optioservus sandersoni	43	6	3
Psephenus herricki	21	10	
Scirtidae			7
Stenelmis	4	3	15
DECAPODA			
Orconectes macrus	-99	1	
Orconectes neglectus	1		3
DIPTERA			
Ablabesmyia		2	
Cardiocladius	2		
Ceratopogoninae	1		1
Cricotopus/Orthocladius	4	2	
Eukiefferiella	7		1
Micropsectra			4
Microtendipes		2	
Parametriocnemus			1
Paratanytarsus			2
Polypedilum aviceps	2		
Polypedilum convictum	31		2
Polypedilum illinoense grp			2
Polypedilum scalaenum grp		1	
Rheotanytarsus	1		9
Simulium	7		
Stempellinella	1	9	2
Stenochironomus			1
Tanytarsus			1
Thienemanniella	1		
Thienemannimyia grp.	3	7	4
Tvetenia			1
EPHEMEROPTERA			
Acentrella	11		

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918410], Station #1a, Sample Date: 10/6/2009 1:15:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Acerpenna	23	16	5
Baetis	131	7	10
Caenis anceps	5	4	1
Caenis latipennis		61	29
Centropilum			1
Choroterpes		2	
Eurylophella	2	3	2
Hexagenia limbata		1	
Isonychia	7		
Leptophlebiidae	6	45	10
Leucocuta	1	7	
Maccaffertium modestum	51	14	4
Stenacron	16	46	3
Stenonema femoratum		13	
Tricorythodes			1
ISOPODA			
Lirceus	25	15	16
LIMNOPHILA			
Ancylidae			1
LUMBRICINA			
Lumbricina			1
LUMBRICULIDA			
Lumbriculidae	1	1	
MEGALOPTERA			
Corydalus	1		
Nigronia serricornis	-99		1
ODONATA			
Boyeria		-99	
Calopteryx			9
Hetaerina			2
PLECOPTERA			
Acroneuria	-99	1	
Neoperla	1		
TRICHOPTERA			
Ceratopsyche morosa grp	3	1	
Cheumatopsyche	37		1
Chimarra	64		
Helicopsyche	2	1	
Polycentropus	1	2	
Triaenodes			1

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918410], Station #1a, Sample Date: 10/6/2009 1:15:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
TRICLADIDA			
Planariidae	28	12	1
VENEROIDA			
Pisidiidae			3

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918411], Station #1b, Sample Date: 10/6/2009 1:15:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		6	1
AMPHIPODA			
Hyaella azteca			43
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
COLEOPTERA			
Dubiraphia			13
Optioservus sandersoni	65	5	18
Psephenus herricki	39	9	3
Scirtidae			2
Stenelmis	3	5	19
DECAPODA			
Orconectes macrus	-99		
Orconectes neglectus	-99	1	
DIPTERA			
Ablabesmyia		5	
Chironomidae	2	1	
Corynoneura		1	
Cricotopus bicinctus	1		
Cricotopus/Orthocladius	5		1
Cryptochironomus		1	
Eukiefferiella	12		
Hexatoma	1		1
Labrundinia			2
Limnophila			1
Microtendipes		6	1
Nilotanytus	1	1	1
Paramerina			2
Paratanytarsus			3
Paratendipes		1	
Phaenopsectra		1	
Polypedilum aviceps	40	2	
Polypedilum illinoense grp	1		3
Rheocricotopus	1		1
Rheotanytarsus	2		12
Simulium	16		1
Stempellinella	8	18	7
Tanytarsus		1	1
Thienemanniella		1	

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918411], Station #1b, Sample Date: 10/6/2009 1:15:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Thienemannimyia grp.	6	5	3
EPHEMEROPTERA			
Acentrella	29		4
Acerpenna	43	20	35
Baetis	112	7	7
Caenis anceps	10	36	
Caenis latipennis		37	34
Choroterpes		3	
Ephemera simulans	1	1	
Eurylophella		3	4
Isonychia bicolor	5		
Leptophlebiidae	5	52	20
Leucrocuta	5	6	
Maccaffertium mediopunctatum	1		
Maccaffertium modestum	70	7	6
Maccaffertium pulchellum			1
Stenacron	13	55	7
Stenonema femoratum		13	2
HEMIPTERA			
Belostoma			-99
Microvelia			1
Rhagovelia			2
ISOPODA			
Caecidotea		1	1
Lirceus	26	18	17
LIMNOPHILA			
Ancylidae			5
LUMBRICULIDA			
Lumbriculidae			5
MEGALOPTERA			
Corydalus	1		
Nigronia serricornis	-99		
ODONATA			
Argia	1		
Calopteryx			7
Hetaerina			1
Ischnura			1
PLECOPTERA			
Acroneuria	-99	2	
Agnetina capitata	5		

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918411], Station #1b, Sample Date: 10/6/2009 1:15:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Neoperla	4		
Zealeuctra	1		
TRICHOPTERA			
Ceratopsyche morosa grp	2		1
Cheumatopsyche	54		7
Chimarra	93	1	1
Helicopsyche	2	1	1
Polycentropus	2		2
Triaenodes			2
TRICLADIDA			
Planariidae	27	3	3
TUBIFICIDA			
Tubificidae	1	2	2

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918415], Station #2, Sample Date: 10/7/2009 2:45:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1	7	1
AMPHIPODA			
Crangonyx	2		
Hyaella azteca		3	107
Stygobromus	1	1	
ARHYNCHOBDELLIDA			
Erpobdellidae	-99	-99	
BRANCHIOBDELLIDA			
Branchiobdellida			1
COLEOPTERA			
Dubiraphia			1
Heterosternuta			1
Optioservus sandersoni	35	3	
Psephenus herricki		-99	
Stenelmis		1	
DECAPODA			
Orconectes macrus	-99	-99	
Orconectes neglectus	1	-99	2
DIPTERA			
Ceratopogoninae		1	
Chironomidae	2	1	
Chironomus		3	
Corynoneura		3	
Cricotopus bicinctus	1		
Cricotopus/Orthocladius	18	3	
Cryptochironomus		8	
Cryptotendipes		1	
Micropsectra	2	1	1
Microtendipes		3	
Paramerina			4
Parametriocnemus	1	1	1
Paratanytarsus		1	
Paratendipes		2	
Polypedilum aviceps	15	1	1
Rheotanytarsus		1	4
Simulium	5		
Stempellinella	1	7	
Tanytarsus		2	
Thienemanniella	2	7	3

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918415], Station #2, Sample Date: 10/7/2009 2:45:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Thienemannimyia grp.		2	
Tvetenia	8		
Zavrelimyia		1	
EPHEMEROPTERA			
Acentrella	3		
Acerpenna	47	17	16
Baetis	112	17	57
Caenis latipennis	6	101	2
Callibaetis			1
Centroptilum			2
Eurylophella			1
Leptophlebiidae	2	38	
Leucrocuta	7	2	
Maccaffertium modestum	23	1	
Pseudocloeon			43
Stenacron	17	27	
Stenonema femoratum		16	
Tricorythodes	1	5	
HEMIPTERA			
Corixidae		2	
Microvelia			1
ISOPODA			
Lirceus	131	66	9
LIMNOPHILA			
Ancylidae	6	2	
Physella		1	6
LUMBRICINA			
Lumbricina	2	2	
LUMBRICULIDA			
Lumbriculidae		3	
ODONATA			
Calopteryx			3
Enallagma			15
Erythemis			-99
Hetaerina			1
PLECOPTERA			
Acroneuria	4		
TRICHOPTERA			
Ceratopsyche morosa grp	16		
Cheumatopsyche	63	1	

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [0918415], Station #2, Sample Date: 10/7/2009 2:45:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Chimarra	13		
Helicopsyche	3	1	
Hydroptila			1
Oxyethira			1
TRICLADIDA			
Planariidae	128	11	
TUBIFICIDA			
Limnodrilus hoffmeisteri		1	
Tubificidae	3	22	
VENEROIDA			
Pisidiidae		7	

Aquid Invertebrate Database Bench Sheet Report**North Indian Cr [0918412], Station #1, Sample Date: 10/6/2009 3:45:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	3		
AMPHIPODA			
Gammarus	217	92	173
Stygobromus	3	1	
ARHYNCHOBDELLIDA			
Erpobdellidae		1	
COLEOPTERA			
Dubiraphia		2	11
Optioservus sandersoni	146	13	1
Scirtidae			2
Stenelmis	4		1
DECAPODA			
Orconectes macrus	-99	-99	
Orconectes neglectus	1	1	1
DIPTERA			
Chironomidae		1	
Corynoneura			1
Cricotopus bicinctus			1
Cricotopus/Orthocladius			1
Cryptochironomus		1	
Dicrotendipes			1
Micropsectra			2
Microtendipes		4	
Parakiefferiella			1
Paramerina			3
Paratanytarsus			1
Polypedilum aviceps			1
Polypedilum fallax grp		1	
Polypedilum scalaenum grp		2	
Rheotanytarsus			1
Stempellinella	1	9	1
Stictochironomus		1	
Thienemanniella			2
Tipulidae			1
EPHEMEROPTERA			
Acentrella	10		1
Acerpenna	2		
Baetis	38	1	6
Caenis latipennis		54	2

Aquid Invertebrate Database Bench Sheet Report**North Indian Cr [0918412], Station #1, Sample Date: 10/6/2009 3:45:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Choroterpes		8	
Leptophlebiidae		22	3
Leucrocuta		1	
Maccaffertium modestum	14	3	
Pseudocloeon			1
Stenacron		17	
Stenonema femoratum		15	
ISOPODA			
Lirceus			7
LIMNOPHILA			
Ancylidae		1	
Menetus			11
LUMBRICINA			
Lumbricina	1	1	
MEGALOPTERA			
Corydalus	-99	-99	
Nigronia serricornis			1
MESOGASTROPODA			
Elimia	11	5	1
ODONATA			
Argia			1
Calopteryx			15
Hetaerina			3
Nasiaeschna pentacantha			1
PLECOPTERA			
Acroneuria	-99		
Perlesta	4	2	
TRICHOPTERA			
Ceratopsyche morosa grp	3		1
Cheumatopsyche	49	1	16
Chimarra	2		
Glossosomatidae	1		
Helicopsyche	19	5	
Limnephilidae			-99
Polycentropus		2	
Triaenodes			4
TRICLADIDA			
Planariidae	48	1	
TUBIFICIDA			
Limnodrilus hoffmeisteri		2	

Aquid Invertebrate Database Bench Sheet Report**North Indian Cr [0918412], Station #1, Sample Date: 10/6/2009 3:45:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Tubificidae		6	
VENEROIDA			
Pisidiidae		2	

Aquid Invertebrate Database Bench Sheet Report**South Indian Cr [0918409], Station #1, Sample Date: 10/6/2009 11:55:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		1	3
AMPHIPODA			
Gammarus	367	120	37
Hyaella azteca			21
Stygobromus		2	
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
BRANCHIOBDELLIDA			
Branchiobdellida	1		1
COLEOPTERA			
Dubiraphia		3	2
Optioservus sandersoni	55	40	1
Psephenus herricki	3		
Stenelmis	1	4	5
DECAPODA			
Orconectes macrus	1	-99	
Orconectes neglectus	-99	-99	9
DIPTERA			
Anopheles			1
Cladotanytarsus			1
Cricotopus/Orthocladius	4		
Cryptochironomus		3	
Dicrotendipes			3
Labrundinia			1
Micropsectra			2
Microtendipes		7	37
Nanocladius			10
Parakiefferiella			2
Paramerina			5
Paratanytarsus			3
Phaenopsectra			1
Polypedilum aviceps	2		9
Polypedilum illinoense grp			2
Rheotanytarsus			1
Stempellinella	5	2	27
Tanytarsus		2	6
Thienemannimyia grp.		2	5
EPHEMEROPTERA			
Acentrella			1

Aquid Invertebrate Database Bench Sheet Report**South Indian Cr [0918409], Station #1, Sample Date: 10/6/2009 11:55:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Acerpenna	3		1
Baetis	27		1
Caenis latipennis		6	12
Choroterpes		1	
Eurylophella	1		3
Heptageniidae	92	47	
Leptophlebiidae	2	13	3
Leucrocuta	58	4	
Maccaffertium modestum	73	8	
Stenacron	17	9	1
Stenonema femoratum		10	
HEMIPTERA			
Corixidae			1
ISOPODA			
Lirceus	3	12	2
LIMNOPHILA			
Ancylidae		2	9
Menetus			26
LUMBRICINA			
Lumbricina	1		
MEGALOPTERA			
Sialis		-99	
MESOGASTROPODA			
Elimia		3	5
Hydrobiidae	1		
ODONATA			
Calopteryx			22
TRICHOPTERA			
Cheumatopsyche	1		5
Helicopsyche	2		
Polycentropus		1	
Pycnopsyche			-99
TRICLADIDA			
Planariidae	35	1	3
TUBIFICIDA			
Limnodrilus hoffmeisteri		1	
Tubificidae			1
VENEROIDA			
Pisidiidae		4	2

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [1004013], Station #1, Sample Date: 4/7/2010 8:15:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	2	7	10
AMPHIPODA			
Gammarus	1	1	7
Hyaella azteca			46
Stygobromus	1		
ARHYNCHOBDELLIDA			
Erpobdellidae	1	-99	
BRANCHIOBDELLIDA			
Branchiobdellida	3	1	4
COLEOPTERA			
Ancyronyx variegatus			1
Dubiraphia		4	20
Dytiscidae		1	
Ectopria nervosa	1		
Optioservus sandersoni	7	2	2
Psephenus herricki	9	5	
Stenelmis	74	15	1
DECAPODA			
Orconectes macrus		-99	
Orconectes neglectus	-99	1	1
DIPTERA			
Ablabesmyia		21	3
Brillia	2		
Cardiocladius	10		
Ceratopogoninae	3	1	
Chironomidae	2		6
Corynoneura	2	3	3
Cricotopus bicinctus			1
Cricotopus/Orthocladius	45	5	33
Cryptochironomus		2	
Dicrotendipes			13
Epoicocladius		1	
Eukiefferiella	5		
Eukiefferiella brevicar grp	70	12	28
Labrundinia			4
Micropsectra			3
Microtendipes		4	
Parakiefferiella			5
Parametriocnemus	1		
Paratendipes		2	

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [1004013], Station #1, Sample Date: 4/7/2010 8:15:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Polypedilum aviceps	6		
Polypedilum convictum	75	1	6
Polypedilum fallax grp	1		
Polypedilum illinoense grp			1
Polypedilum scalaenum grp		2	
Rheotanytarsus	1		4
Simulium	23	1	
Stempellinella	3	7	1
Synorthocladius		2	1
Tanytarsus	3	2	3
Thienemanniella			3
Thienemannimyia grp.	4		7
Tipula	-99		
Tribelos		2	
Tvetenia bavarica grp	7		
EPHEMEROPTERA			
Acentrella	1		
Acerpenna	13		
Anthopotamus		3	1
Baetis	34	1	2
Caenis anceps		14	
Caenis latipennis	4	44	9
Callibaetis			3
Centroptilum		1	2
Dipheter	31		1
Ephemera simulans		6	
Ephemerella invaria	5		
Eurylophella bicolor	11	27	22
Heptageniidae	11	2	
Isonychia bicolor	5		
Leptophlebia		17	4
Leptophlebiidae			9
Leucrocuta	14	1	
Maccaffertium bednariki	4		
Maccaffertium mediopunctatum	15		
Maccaffertium modestum	1		
Maccaffertium pulchellum	8		1
Stenacron	5	20	
Stenonema femoratum		3	
ISOPODA			
Lirceus	32	4	32

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [1004013], Station #1, Sample Date: 4/7/2010 8:15:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
LIMNOPHILA			
Ancylidae		2	1
Physella			1
LUMBRICINA			
Lumbricina	2	1	
LUMBRICULIDA			
Lumbriculidae	11		
MEGALOPTERA			
Corydalus	-99		
MESOGASTROPODA			
Elimia	2		
Hydrobiidae		3	1
ODONATA			
Calopteryx			-99
Enallagma			2
Hetaerina			1
PLECOPTERA			
Acroneuria	4		
Amphinemura	1		
Isoperla	2		
Leuctridae	2		
Perlesta	7		2
TRICHOPTERA			
Cheumatopsyche	1		
Chimarra	1		
Helicopsyche	1		
Oecetis			3
Polycentropus			1
Pycnopsyche	-99	-99	10
Triaenodes			1
TRICLADIDA			
Planariidae	10	2	1
TUBIFICIDA			
Limnodrilus hoffmeisteri	1	5	
Tubificidae	1	4	1
VENEROIDA			
Pisidiidae	2	1	1

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [1004014], Station #2, Sample Date: 4/7/2010 10:10:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	4	8	1
AMPHIPODA			
Gammarus	188	136	128
Hyaella azteca			2
Stygobromus		1	
BRANCHIOBELLELLIDA			
Branchiobdellida		2	
COLEOPTERA			
Dubiraphia		2	3
Macronychus glabratus			1
Optioservus sandersoni	81	15	7
Psephenus herricki	10	2	-99
Stenelmis	16		8
DECAPODA			
Orconectes	-99		
Orconectes neglectus		-99	-99
DIPTERA			
Ceratopogoninae	7	1	
Chironomidae			2
Cladotanytarsus		2	
Corynoneura		2	1
Cricotopus/Orthocladius	9	3	1
Cryptochironomus		6	
Diptera	1		
Eukiefferiella	48	2	6
Micropsectra	5	3	4
Microtendipes		1	
Nanocladius		1	1
Paratanytarsus		1	
Polypedilum aviceps	10		4
Polypedilum illinoense grp		1	2
Polypedilum scalaenum grp		9	
Rheotanytarsus			1
Simulium	4		3
Stempellinella	2	5	
Tanytarsus		1	1
Thienemanniella	1		1
Thienemannimyia grp.	4	2	14
Tvetenia	1		

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [1004014], Station #2, Sample Date: 4/7/2010 10:10:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
EPHEMEROPTERA			
Acentrella	7		
Acerpenna	11	2	6
Baetis	9		2
Caenis latipennis	1	67	26
Dipheter	39	1	18
Ephemera simulans	2	-99	-99
Eurylophella bicolor	1	6	12
Isonychia bicolor	1		
Leptophlebia		3	1
Leucrocuta	35	7	
Maccaffertium bednariki	1		
Maccaffertium modestum	24	4	5
Maccaffertium pulchellum	3		
Paraleptophlebia	7		
Stenacron	3	6	
Stenonema femoratum	-99	2	1
HEMIPTERA			
Corixidae		1	
Microvelia			1
ISOPODA			
Caecidotea (Blind & Unpigmented)	1		
Lirceus	1	1	1
LIMNOPHILA			
Physella			11
LUMBRICINA			
Lumbricina	3	1	1
LUMBRICULIDA			
Lumbriculidae	1	2	
MEGALOPTERA			
Corydalus	-99		
Nigronia serricornis	-99		2
MESOGASTROPODA			
Elimia	5	2	26
ODONATA			
Calopteryx			3
Gomphidae	1		
PLECOPTERA			
Acroneuria	-99		
Isoperla	2		

Aquid Invertebrate Database Bench Sheet Report**Indian Cr [1004014], Station #2, Sample Date: 4/7/2010 10:10:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Zealeuctra	15		9
TRICHOPTERA			
Agapetus	20		
Cheumatopsyche	7		4
Chimarra	1		
Helicopsyche	18	4	
Lype diversa	2		
Oecetis			1
Pycnopsyche		1	3
Triaenodes			3
TRICLADIDA			
Planariidae	14		
TUBIFICIDA			
Limnodrilus hoffmeisteri	1	16	
Tubificidae	2	46	
VENEROIDA			
Pisidiidae		3	2

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004010], Station #1a, Sample Date: 4/6/2010 2:25:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	11	10	12
AMPHIPODA			
Crangonyx	3		
Hyaella azteca		3	7
Stygobromus		1	
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
BRANCHIOBDELLIDA			
Branchiobdellida		1	2
COLEOPTERA			
Dytiscidae		4	
Optioservus sandersoni	17	6	1
Psephenus herricki	2	2	
Stenelmis	4	4	1
DECAPODA			
Orconectes macrus		-99	
Orconectes neglectus	-99	-99	1
DIPTERA			
Ablabesmyia		7	
Ceratopogoninae	3	3	
Chelifera			1
Corynoneura		3	1
Cricotopus bicinctus			1
Cricotopus/Orthocladius	6	3	9
Cryptochironomus		3	
Eukiefferiella	47	3	66
Hexatoma	1	-99	
Micropsectra	7	7	6
Microtendipes	3	1	
Nilotanytus		1	
Polypedilum aviceps	25	4	7
Polypedilum convictum		1	
Polypedilum scalaenum grp		1	
Rheocricotopus			1
Rheotanytarsus			13
Simulium	1		3
Stempellinella	3	5	1
Tanytarsus		1	
Thienemanniella		3	1

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004010], Station #1a, Sample Date: 4/6/2010 2:25:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Thienemannimyia grp.	8	14	2
Tipula	1		
Zavreliomyia		3	
EPHEMEROPTERA			
Acentrella	1		
Acerpenna	49	23	94
Baetis			1
Caenis latipennis	4	75	7
Dipheter	70	4	31
Ephemera simulans		-99	
Eurylophella bicolor		6	7
Isonychia bicolor	2		
Leucrocuta	34	26	
Maccaffertium mediopunctatum		-99	
Maccaffertium modestum	22	16	3
Maccaffertium pulchellum	2	2	1
Paraleptophlebia	10	3	2
Stenacron	2	15	
Stenonema femoratum		10	
ISOPODA			
Lirceus	154	85	35
LIMNOPHILA			
Ancylidae			1
LUMBRICINA			
Lumbricina	1	-99	
LUMBRICULIDA			
Lumbriculidae		2	
MEGALOPTERA			
Corydalus	1		
Nigronia serricornis	1	1	
ODONATA			
Calopteryx			1
Ischnura			-99
PLECOPTERA			
Acroneuria	1	-99	
Agnetina capitata	2	-99	2
Hydroperla crosbyi	2		
Isoperla	-99	-99	-99
Perlesta	2		1
Zealeuctra	59	24	

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004010], Station #1a, Sample Date: 4/6/2010 2:25:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
TRICHOPTERA			
Cheumatopsyche	7	-99	-99
Chimarra	11	-99	
Helicopsyche	1	1	
Hydroptila	1		
Oxyethira			1
Polycentropus	-99	-99	
Psychomyia	1		
Pycnopsyche		-99	-99
TRICLADIDA			
Planariidae	23	5	3
TUBIFICIDA			
Limnodrilus hoffmeisteri	1		
Tubificidae		2	

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004011], Station #1b, Sample Date: 4/6/2010 2:25:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	20	6	15
AMPHIPODA			
Crangonyx	4	3	
Hyaella azteca			6
BRANCHIOBDELLIDA			
Branchiobdellida	1		
COLEOPTERA			
Dubiraphia			1
Ectopria nervosa		1	
Optioservus sandersoni	15	6	
Psephenus herricki	6		
Stenelmis	4	3	10
DECAPODA			
Orconectes neglectus	-99	-99	-99
DIPTERA			
Ceratopogoninae	8	2	
Corynoneura		1	1
Cricotopus bicinctus			1
Cricotopus/Orthocladius	4	2	2
Cryptochironomus		1	
Diamesa	2		
Dicrotendipes		2	
Diptera		4	
Eukiefferiella	34	3	8
Hemerodromia			1
Hexatoma		-99	
Hydrobaenus		2	
Micropsectra	5	2	9
Microtendipes		2	
Nilotanytus			1
Paramerina			1
Paratanytarsus			2
Paratendipes	1		
Polypedilum aviceps	9	1	2
Polypedilum scalaenum grp		1	
Rheotanytarsus			3
Simulium	2		1
Stempellinella	1	7	2
Tanytarsus		1	2

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004011], Station #1b, Sample Date: 4/6/2010 2:25:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Thienemanniella		2	
Thienemannimyia grp.	3	7	11
Tipula	-99		
EPHEMEROPTERA			
Acerpenna	67	33	94
Baetis	8	1	2
Caenis latipennis	3	56	23
Diphetor	114	8	12
Ephemera simulans		-99	
Eurylophella bicolor	3	6	17
Heptageniidae	18	2	1
Leptophlebiidae	16	8	
Leucrocuta	16	19	
Maccaffertium bednariki	3	1	
Maccaffertium modestum	19	2	3
Maccaffertium pulchellum	2		1
Stenacron	5	18	2
Stenonema femoratum		-99	
Tricorythodes			2
ISOPODA			
Lirceus	113	68	55
LUMBRICINA			
Lumbricina	-99		
ODONATA			
Calopteryx			1
Stylogomphus albistylus		1	
PLECOPTERA			
Acroneuria		-99	
Agnetina capitata	2		
Haploperla	1		
Isopterla	-99		-99
Perlesta	2		1
Zealeuctra	41	20	
TRICHOPTERA			
Cheumatopsyche	4		4
Chimarra	10		
Helicopsyche	2		-99
Hydroptila	1		1
Lype diversa			1
Polycentropus	2	2	3
Pycnopsyche		1	1

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004011], Station #1b, Sample Date: 4/6/2010 2:25:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Triaenodes			1
TRICLADIDA			
Planariidae	22	6	2
TUBIFICIDA			
Enchytraeidae	1		
Tubificidae		2	
VENEROIDA			
Pisidiidae			1

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004012], Station #2, Sample Date: 4/7/2010 4:10:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	2	8	12
AMPHIPODA			
Crangonyx	13	26	6
Hyaella azteca		8	37
Stygobromus	2		
ARHYNCHOBDELLIDA			
Erpobdellidae	-99	4	
BRANCHIOBDELLIDA			
Branchiobdellida	4	2	5
COLEOPTERA			
Dytiscidae		1	
Optioservus sandersoni	13	2	
Scirtidae			1
Stenelmis	2	2	
DECAPODA			
Orconectes macrus	2	-99	
Orconectes neglectus	-99	-99	1
DIPTERA			
Brillia		1	1
Ceratopogoninae	1	4	1
Chironomidae	1		
Cricotopus bicinctus			1
Cricotopus/Orthocladius	7	7	10
Cryptochironomus	1		
Dicrotendipes		9	4
Eukiefferiella	5	1	2
Hexatoma	-99		
Micropsectra	2	4	14
Microtendipes		1	
Parametriocnemus		1	
Paratanytarsus			1
Paratendipes		2	
Polypedilum aviceps	1	2	
Polypedilum halterale grp		1	
Polypedilum scalaenum grp		1	
Rheotanytarsus			1
Simulium	8		3
Smittia		1	
Stempellinella		1	

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004012], Station #2, Sample Date: 4/7/2010 4:10:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Tanytarsus			1
Thienemanniella		1	5
Thienemannimyia grp.	10	2	
Tvetenia	1		
EPHEMEROPTERA			
Acentrella	2		
Acerpenna	33	39	66
Baetis	2		
Caenis latipennis	1	38	3
Centropilum		1	1
Diphetor	239	16	76
Eurylophella		1	
Heptagenia	2	1	
Heptageniidae	17	2	
Leptophlebia		2	
Leptophlebiidae	2	3	
Leucrocuta	11	18	
Maccaffertium modestum	16	7	2
Stenacron	3	6	
Stenonema femoratum	2	12	
Tricorythodes		6	2
HEMIPTERA			
Microvelia			1
Sigara		2	
ISOPODA			
Caecidotea (Blind & Unpigmented)		1	
Lirceus	307	121	12
LIMNOPHILA			
Physella			3
LUMBRICINA			
Lumbricina	4	7	1
LUMBRICULIDA			
Lumbriculidae	10	8	
ODONATA			
Calopteryx			-99
PLECOPTERA			
Acroneuria	-99		
Agnetina capitata	3		
Isoperla	-99		1
Perlesta			1

Aquid Invertebrate Database Bench Sheet Report**Middle Indian Cr [1004012], Station #2, Sample Date: 4/7/2010 4:10:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Perlinella drymo		-99	
Zealeuctra	9	3	
TRICHOPTERA			
Cheumatopsyche	5		1
Chimarra	2		
Helicopsyche		1	
Hydroptila		1	4
Polycentropus	2		
Pycnopsyche			2
TRICLADIDA			
Planariidae	46	38	6
TUBIFICIDA			
Enchytraeidae	1		1
Limnodrilus hoffmeisteri		2	
Limnodrilus udekemianus			1
Tubificidae	2	2	2
VENEROIDA			
Pisidiidae		1	

Aquid Invertebrate Database Bench Sheet Report**North Indian Cr [1004008], Station #1, Sample Date: 4/6/2010 11:30:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1	2	1
AMPHIPODA			
Gammarus	432	215	128
Stygobromus	9		
COLEOPTERA			
Dubiraphia			5
Optioservus sandersoni	38	12	2
Scirtidae			2
Stenelmis	5		
DECAPODA			
Orconectes macrus	-99		
Orconectes neglectus	-99		-99
DIPTERA			
Ceratopogoninae	6	3	
Corynoneura		2	1
Cricotopus bicinctus			1
Cricotopus/Orthocladius	9		5
Cryptochironomus	1	1	
Dicrotendipes			1
Eukiefferiella	21	1	5
Labrundinia			1
Micropsectra	5	3	24
Microtendipes	1	2	
Nanocladius			1
Parametriocnemus	2		
Paratanytarsus			2
Paratendipes		3	
Polypedilum aviceps	2		3
Polypedilum illinoense grp			4
Polypedilum scalaenum grp	1	4	
Rheotanytarsus			1
Stempellinella	2	2	2
Thienemanniella	1		2
Thienemannimyia grp.	2		1
EPHEMEROPTERA			
Acentrella	5		
Acerpenna	7	1	74
Baetis	4		1
Caenis latipennis	1	24	2

Aquid Invertebrate Database Bench Sheet Report**North Indian Cr [1004008], Station #1, Sample Date: 4/6/2010 11:30:00 AM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Diphetor	8		26
Eurylophella bicolor		1	11
Leptophlebiidae	10	2	2
Leucrocuta	34	7	1
Maccaffertium mediopunctatum	1		
Maccaffertium modestum	6	-99	4
Stenacron	5	7	
Stenonema femoratum	-99	1	1
Tricorythodes			1
ISOPODA			
Lirceus	1	1	7
LIMNOPHILA			
Ancylidae		1	
LUMBRICINA			
Lumbricina	4		
MESOGASTROPODA			
Elimia	1	4	1
ODONATA			
Calopteryx			3
PLECOPTERA			
Acroneuria	-99	-99	
Isoperla	-99		
Perlesta	1		
TRICHOPTERA			
Cheumatopsyche	-99		
Chimarra	-99		
Helicopsyche	2	3	
Oecetis		1	
Polycentropus	-99	-99	
Pycnopsyche		-99	4
Triaenodes			2
TRICLADIDA			
Planariidae	3	1	
TUBIFICIDA			
Enchytraeidae			2
Limnodrilus hoffmeisteri		1	
Tubificidae	8	3	1
VENEROIDA			
Pisidiidae	2		

Aquid Invertebrate Database Bench Sheet Report**South Indian Cr [1004009], Station #1, Sample Date: 4/6/2010 1:30:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	4	12	9
AMPHIPODA			
Gammarus	246	73	114
ARHYNCHOBDELLIDA			
Erpobdellidae			3
BRANCHIOBDELLIDA			
Branchiobdellida			1
COLEOPTERA			
Dubiraphia			2
Dytiscidae		2	
Optioservus sandersoni	8	8	2
Psephenus herricki	-99	-99	
Stenelmis		4	2
DECAPODA			
Orconectes macrus	-99		
Orconectes neglectus	-99	-99	1
DIPTERA			
Ablabesmyia		3	
Brillia			2
Ceratopogoninae		3	1
Chelifera	1		
Chironomidae	1	2	1
Corynoneura		2	
Cricotopus/Orthocladius	24	13	8
Dicrotendipes		2	2
Eukiefferiella	24	1	5
Hexatoma		-99	
Limnophyes		1	
Micropsectra	3	1	6
Microtendipes		1	3
Nanocladius	1		2
Paratanytarsus		1	1
Paratendipes		2	
Polypedilum aviceps	13	2	1
Polypedilum illinoense grp		1	
Polypedilum scalaenum grp		12	
Rheocricotopus			1
Simulium	9	1	
Stempellina		1	

Aquid Invertebrate Database Bench Sheet Report**South Indian Cr [1004009], Station #1, Sample Date: 4/6/2010 1:30:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
Stempellinella		5	1
Synorthocladius		1	
Tanytarsus	1	7	
Thienemanniella	1		2
Thienemannimyia grp.	6	13	7
Tipula		-99	
Tvetenia			2
Zavrelimyia		1	
EPHEMEROPTERA			
Acentrella	5		
Acerpenna	22		30
Baetis	10		4
Caenis latipennis		19	9
Centroptilum			1
Dipheter	42		14
Eurylophella bicolor		32	41
Leptophlebia			6
Leucrocuta	39	15	
Maccaffertium bednariki	2		
Maccaffertium modestum	28	3	3
Maccaffertium pulchellum	1		
Paraleptophlebia	8	16	1
Stenacron	37	27	1
Stenonema femoratum		9	
ISOPODA			
Lirceus	65	45	14
LIMNOPHILA			
Ancylidae			1
Menetus			4
LUMBRICINA			
Lumbricina	-99	1	
LUMBRICULIDA			
Lumbriculidae		1	
MESOGASTROPODA			
Elimia	1		
ODONATA			
Calopteryx			5
PLECOPTERA			
Chloroperlidae		1	
Zealeuctra	1	12	

Aquid Invertebrate Database Bench Sheet Report**South Indian Cr [1004009], Station #1, Sample Date: 4/6/2010 1:30:00 PM****CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence**

ORDER: TAXA	CS	NF	RM
TRICHOPTERA			
Cheumatopsyche	1		
Chimarra	-99		
Helicopsyche	-99		1
Polycentropus	2	1	1
Pycnopsyche		-99	1
Triaenodes			1
TRICLADIDA			
Planariidae	28	21	